1854MNRAS..14..218P

## *The Comet of April* (*Comet II.*) 1854. By Eyre B. Powell, Esq. F.R.A.S.

"On the evening of the 4th April last my attention was caught by a star-like object in the west, badly defined, and with a short, indistinct ray running upwards. On turning a 3½-foot telescope upon the object, it was at once seen to be a comet. Time did not allow me to measure the right ascension and declination of the stranger that evening; but, on the 5th and succeeding nights, up to the 28th, with one or two breaks, I managed to secure observations more or less trustworthy. These are given in the following table; and they were taken with a 5-foot refracting telescope by Messrs. Simms, mounted equatoreally in a small octagonal room, erected for the reception of the instrument, within the grounds attached to the Government Native College. This room is exactly the counterpart of the one at the Madras Observatory, and was constructed under the superintendence of Captain Jacob, the Hon. East India Company's Astronomer. The object-glass of the telescope is 4 inches in diameter, and performs very satisfactorily; the magnifying power generally applied was about 55; but a higher power was used at first. On the 5th, 6th, and 7th April, I obtained the right ascension and declination of the comet directly from the readings of the equatoreal, the hour-circle of which measures seconds of time, and the declination-circle minutes of space. The errors of adjustment were found by comparing the instrumental right ascension and declination of a known star, having the same hour-angle and nearly the same declination as the comet, with the catalogued values of those quantities. On the remaining nights the position of the comet was ascertained by taking differential observations of it with one or more stars. At first the comparison stars were selected from the British Association Catalogue; but, towards the end of April, I was obliged to fall back upon Weisse, no large stars lying about the comet's path.

*Observations* (*affected with Parallax and Aberration*).

| Day. 1853. | Madras Sid. Time. h m s | R.A. h m s | Decl. ° ′ ″ |
|---|---|---|---|
| April 5 | 7 56 30 | 2 42 38 | (+) 15 30 50 |
| 6 | 7 58 57·5 | 2 54 23·5 | 14 31 52 |
| 7 | 8 14 46 | 3 5 24 | 13 31 53 |
| 8 | 7 54 17 | 3 15 31 | 12 32 9 |
| 9 | 8 6 51 | 3 25 14 | 11 30 34 |
| 10 | 8 25 53 | 3 34 18 | 10 30 33 |
| 11 | 8 16 23 | 3 42 40 | 9 33 3 |
|  | 8 49 36 | 3 42 51 | 9 31 39 |
| 12 | 8 13 43 | 3 50 29·5 | 8 36 42·5 |
| 13 | 8 53 0 | 3 58 4·4 | 7 40 54 |
| 15 | 8 34 10 | 4 11 23·3 | 5 58 59 |
| 16 | 8 49 40 | 4 17 34·6 | 5 10 12 |

1854MNRAS..14..218P

| Day. | Madras Sid. Time. | R.A. | | Decl. |
|---|---|---|---|---|
| 1853. | h m s | h m s | | ° ′ ″ |
| April 18 | 9 4 55 | 4 28 48·6 | (+) | 3 39 38 |
| 19 | 9 6 24·5 | 4 33 58 | | 2 57 36 |
| 22 | 9 28 38·7 | 4 47 55 | | 1 1 37 |
| 23 | 9 18 25 | 4 52 10 | (+) | 0 26 19 |
| 24 | 9 29 7·5 | 4 56 14 | (−) | 0 7 33 |
| 26 | 9 33 59 | 5 3 46 | | 1 10 52 |
| 27 | 9 47 46 | 5 7 19·6 | | 1 40 51 |
| 28 | 9 45 24·4 | 5 10 45 | | 2 9 32 |

Number of Comparisons or Direct Observations.

April 5. One direct observation.
6. Three direct observations.
7. Three direct observations.
8. One direct observation, and one comparison with B.A.C. 1087.
9. One direct observation, and two comparisons with 4 *Tauri.*
10. Three comparisons with B.A.C. 1174.
11. Four comparisons with Weisse iii. 814.
Three comparisons with B.A.C. 1180.
12. Two comparisons with B.A.C. 1295 and 1304.
13. Four comparisons with B.A.C. 1296.
15. Four comparisons with Taylor 1468 and 1499.
16. Six comparisons with Weisse iv. 361, 506, and 554.
18. Eight comparisons with Weisse iv. 608.
19. Seven comparisons with Weisse iv. 754.
22. Five comparisons with two small stars, which were again compared with *β Eridani.*
23. Three comparisons with Weisse iv. 1207.
24. Three comparisons with Weisse iv. 1346.
26. Three comparisons with Weisse v. 129.
27. Five comparisons with Weisse v. 169.
28. Two comparisons with Weisse v. 419.

“ On the 5th the outline of the envelope was sharp; the length of the comet measured about 22′; and the nucleus was pretty bright, possibly equal to a star of the 3.4 magnitude.

“ On the 6th I estimated the diameter of the nucleus at 8″; it was ragged, and equal to a star of the 4th magnitude. The tail was about 30′ long by measurement; also I fancied it not so broad as on the 5th.

“ On the 7th the views I obtained were rather indistinct, in consequence of some clouds drifting across the western sky from south to north; but, with the exception of the nucleus appearing somewhat larger, the comet presented nearly the same aspect as on the 6th.

“ On the 8th, owing partly to the moon, now on the increase and beginning to ‘shine down’ the faint light of the comet, the outline of the envelope was indiscernible. The nucleus was about as bright as a 6th magnitude star.

“ On the 12th a small star was visible through the tail.

“ On the 18th the comet would not bear any illumination, and the transits were taken on the lower edge of the micrometer comb. I trust that the care expended on the observations compensated in

1854MNRAS..14..218P

a great degree for the imperfection naturally belonging to the mode of observing. The tail was longer, perhaps about 1° in length.

"On the 28th the comet was so excessively faint that the observations were taken with the greatest difficulty. In fact, it was no more than a small, whitish, cloudy patch; still there was something like a faint star as a nucleus: this was especially noted as the comet passed through the zero hole of the comb.

"Taking the observations of the 8th, 13th, 18th, and 27th, I proceeded to calculate the orbit.

"To obtain the perihelion distance and the time of perihelion passage, I used Pontécoulant's modification of La Place's method, given in the Appendix to tome ii. of the *Théorie Analytique du Système du Monde*. The following are the chief data and results; the notation corresponding to that of Pontécoulant:—

| Epochs, Greenwich M.T. | Longitudes Observed. | Latitudes Observed. |
|---|---|---|
| | ° ′ ″ | ° ′ ″ |
| April 8·06067 | 49 50 56 ($a^{\circ}$) | 5 22 24 ($b^{\circ}$) (−) |
| 13·08769 | 59 0 3 ($a$) | 12 33 19 ($b$) (−) |
| 18·08229 | 66 1 16 ($a'$) | 17 55 12 ($b'$) (−) |

$$\frac{da}{dt} = +1{\cdot}63593$$

$$\frac{d^2a}{dt^2} = -4{\cdot}884596$$

$$\frac{db}{dt} = -1{\cdot}269075$$

$$\frac{d^2b}{dt^2} = +4{\cdot}17352$$

$$r^2 = 1{\cdot}00692 - 1{\cdot}62997 \cdot \varrho + 1{\cdot}0496 \cdot \varrho^2$$

$$\frac{1}{r} = {\cdot}496558 - 1{\cdot}8551335 \cdot \varrho + 2{\cdot}941991 \cdot \varrho^2$$

$$\frac{\delta\varrho}{dt} = + {\cdot}919686\, \varrho$$

"Assuming $r = {\cdot}65$, and $\varrho = {\cdot}99$, as suggested by trials,

$$\delta r = -{\cdot}00070196 \text{ and } \delta\varrho = -{\cdot}0008311$$

$$\therefore\; r = {\cdot}649298 \quad \text{and} \quad \varrho = {\cdot}9891689$$

"Using these values in approximating,

$$\delta r = +{\cdot}0000020 \quad \text{and} \quad \delta\varrho = -{\cdot}0000007$$

Hence $r = {\cdot}6493$ and $\varrho = {\cdot}989168$

Also $r \cdot \frac{dr}{dt} = +{\cdot}868954$

"Therefore D, the perihelion distance $= {\cdot}27176$, and the time of perihelion passage $=$ March 24·0028, $v$ being 99° 22′ 34″.

1854MNRAS..14..221R

" Then, by comparing the differences of the anomalies, afforded first by the parabolic theory *per se*, and secondly by it and the observations combined; and by tracing the effects upon those differences of variations in the above fundamental elements, I found, after about four approximations,

$\nu - u = -(1' - 19'')$ for the error of anomaly between the 8th and 13th

and $\nu' - u' = +(4' - 12'')$ — — — 8th and 27th

" The above errors might be almost eliminated by varying slightly the time of perihelion passage; but, without taking aberration and parallax into account, further calculation would appear to be labour thrown away.

" The corresponding elements are as follow :—

### " *Elements.*

Time of Perihelion Passage, March 24·0501

| | |
|---|---|
| Perihelion Distance | ·27975 |
| | ° ′ |
| Longitude of Perihelion on Ecliptic | 171 21 |
| Longitude of Ascending Node | 316 28 |
| Inclination of Orbit | 81 20 |

Motion retrograde.

" Hence it seems that the comet is not one whose elements have been already ascertained. There is, however, a considerable approach to agreement between some of its elements and the corresponding ones of a comet observed by Hevelius in 1677, the orbit of which was calculated by the celebrated Halley.

" Thus :—

| | Motion. | Perihelion Distance. | Inclination. |
|---|---|---|---|
| | | | ° ′ |
| Comet of 1677 | Retrograde | ·28059 | 79 3 |
| Comet of 1854 | Retrograde | ·27975 | 81 20 |

"*Madras, May 16th*, 1854."

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## *Elements of Proserpine, for the Opposition in* 1854.

Computed by Mr. George Rümker, Observer at the Observatory, Durham, from the following four normal places, deduced from all the recorded observations at her last appearance :—

| | R.A. | N.P.D. | |
|---|---|---|---|
| 1853. | ° ′ ″ | ° ′ ″ | |
| May 20·5 | 205 10 21·8 | 99 49 5·5 | from 27 observations. |
| June 3·0 | 204 3 20·1 | 99 47 55·9 | — 14 — |
| 27·0 | 204 12 20·1 | 100 13 41·2 | — 9 — |
| July 6·0 | 206 23 23·7 | 101 28 7·9 | — 14 — |